SPECIAL TOPIC

Relationships Among NGN, Softswitch and IMS

Abstract:
The Next Generation Network (NGN) has been a term frequently quoted in the hot topics of Telecommunication industry. The Softswitch and the IP Multimedia Subsystem (IMS) are proposed to implement the NGN services. It is imperative to reach a consensus on positioning and planning their future directions. However, it is rather difficult to realize smooth network evolution towards IMS as the Softswitch mainly supports the traditional Public Switched Telephone Network (PSTN) and Integrated Services Digital Network (ISDN) services. In addition, the basic and complementary services of Softswitch are offered locally.

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Since the concept appearance of Next Generation Network (NGN), topics about its name, definition, and service range have been intensely discussed. What technology is better for the service layer has also become a focus issue. The original viewpoint considers NGN as a multi-service and integrated network system, and Softswitch is the main network technology for the service layer. Later the IP Multimedia Subsystem (IMS) was introduced and it was considered that IMS would supersede NGN as the primary network technology. Then, what is the relationship among NGN, Softswitch, and IMS? What is Softswitch oriented for? These questions will be analyzed and discussed in the following paragraphs.

1 Next Generation Network

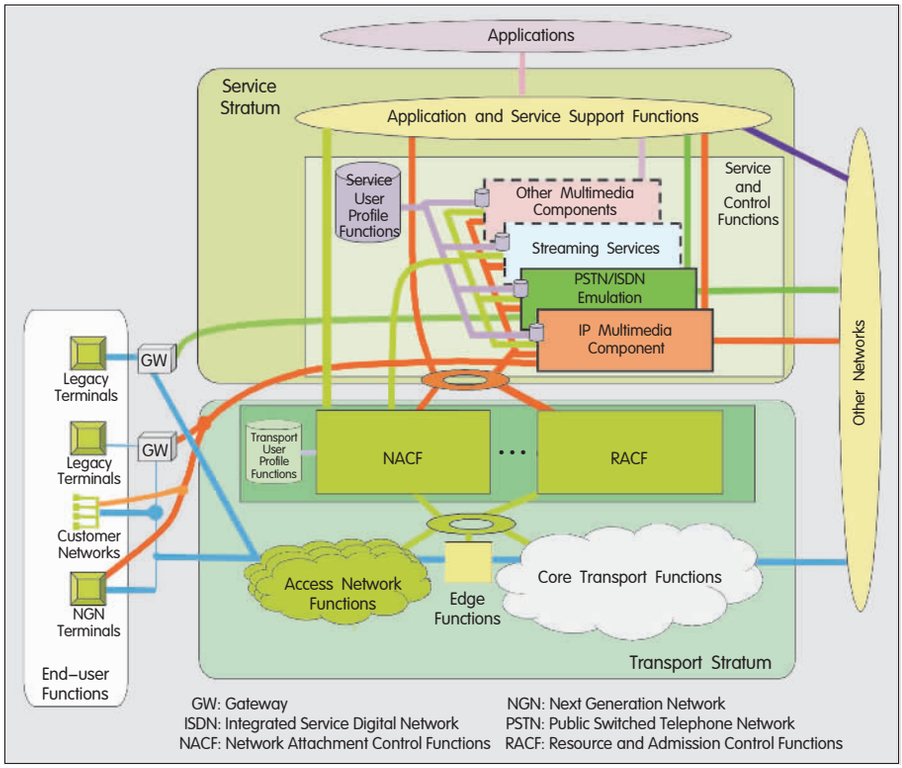
The literal interpretation of NGN is ambiguous, therefore, for every network following the preceding one can be called the next generation network. Actually, NGN at the current researching stage is a packet-based core network, rather than a time-division-multiplexing network. It provides multiple services in addition to the traditional telecommunications services, and supports several broadband and Quality of Service (QoS)-enabled transport technologies. Service-related functions are independent of transport technologies. According to the choices of the users, it enables unfettered access to the networks, service providers and services. Therefore, the name—NGN—is chosen to emphasize its innovative and revolutionary characteristics, compared with previous networks.

The NGN is capable of providing full-services with various bandwidths via wired or wireless, including voice, data, video, streaming media, Internet access, digital TV broadcast, mobile, and more. With its open interfaces, different service providers can build and introduce their services. From the user's point of view, NGN should cover all available telecommunications services and applications from the current service environments (such as telephone services, wireless/mobile services, broadcast and distributed services,and Internet). The services and applications mentioned indicate that NGN is not a revolutionary goal, but a perfect goal. That is, the new technology acts as a substitute not only to implement all services and applications of the existing networks, but also to accommodate all that possible in the future.

2 Softswitch and Its Orientation

The technology which is bearer independent of control is used for the Softswitch in the evolution of telecommunications switching networks. It employs the data transmission capacity of packet data networks to transfer media, and makes call control functions, media bearing functions and service functions of traditional circuit switches independent. Softswitches no longer deal with media streams or service attributes. They are only responsible for the basic call control. Different gateways are used to access different users.

The Softswitch technology is originally aimed to separate bearer from control and control from service, while using transport capabilities of IP networks to carry the Voice over IP (VoIP) service. This technology contributes to providing voice-based Value Added Services (VASs) faster and more effectively by operators according to the requirements of different user groups. Thanks to the ability of IP network to transfer integrated services, including the IP-based voice,



▲Figure 1. Configuration of the next generation network.

video and multimedia services, it is realistic to hope to provide multiple services over a single network. Therefore, if Softswitch is able to control these services, it realizes the ideal network convergence and service integration, which is targeted by the telecommunication industry. For the reason mentioned, the Session Initiation Protocol (SIP) users with broadband access are added into the Softswitch controlled network. The SIP users can acquire broadband video, multimedia, and some data services under the control of Softswitch.

However, the emergence of IMS set by NGN blocked the development of the original idea aforementioned. Telecommunication and Internet converged Services and Protocols for Advanced Networks (TISPAN) of European Telecommunications Standards Institute (ETSI) planned to propose four service components of NGN. The four components are the Public Switched Telephone Network (PSTN)/Integrated Services Digital Network (ISDN) emulation component, the IMS component, the streaming component, and other multimedia components. In addition, the ITU–T SG13 introduced the configuration of NGN (see Figure 1), in which the part based on IMS is the main body of NGN, and ITU–T insists that IMS is the direction of NGN evolution. It can emulate PSTN/ISDN services, offer IMS–based broadband services, and enable Fixed Mobile Convergence (FMC) by supporting fixed and mobile broadband users simultaneously. Because the study on IMS–based network convergence was launched not long before, there is much room for improving its maturity and stability, as well as the related standardization.

Presently, quite a few operators are faced with the problem of how to evolve traditional circuit–based PSTN/ISDN into packet–based NGN. At the meeting of ITU NGN in December 2004, it was agreed to initiate the standardization of Call Server (CS)–based PSTN/ISDN Emulation Subsystem (PES) network evolution. The Focus Group on NGN (FGNGN) started the research on PSTN evolution in June 2004, and proposed a CS–based solution with examples for PSTN evolution. The CS–based solution mainly achieves the evolution of circuit switching networks, while IMS primarily carries out multimedia services. Both of them will coexist for a long term as IMS matures.

Accordingly, evolution from circuit switching into packet switching through Softswitch is an important technical drive for the development of telephone networks. The IMS is a potential total architecture to converge fixed and mobile broadband networks with multimedia services in the future.

The Softswitch is a way for fixed network operators driven by market and service competitions to build NGN at this stage. The Softswitch can provide C4 services to substitute traditional circuit switching and make trunk call. It can also provide C5 services by connecting different terminals to core service networks via data access.

There are two structures to construct Softswitch networks. One is temporarily named as integrated Softswitch which accesses different wireline users, including narrowband and broadband users. The other consists of narrowband and broadband Softswitch, where Media Gateway Controller (MGC) and SIP server, which are responsible for the access and control of narrowband and broadband users respectively, are cooperatively used for Softswitch services.

Softswitch is a preliminary stage of the NGN and it aims to the services related to wireline users. However, its development should provide room for future requirements of NGN. If operators set the CS–based PES network as the target of PSTN evolution at the beginning of the design of NGN, the consideration of the requirements for the construction and evolution of Softswitch networks is a must. Therefore, the narrowband Softswitch can be deployed to meet the demands of the market. It is recommended that integrated Softswitch, rather than broadband Softswitch, should be used for the network construction, although there are requirements for broadband services.

The broadband Softswitch mainly offers voice service on devices similar to IP terminals through the SIP server. It seems that broadband Softswitch supports mobility of these terminals and meets some requirements of IP voice,

and the SIP server can evolve into IMS according to its standards. However, there is a big gap between the Softswitch and IMS. Specifically, the broadband Softswitch has no centralized database setting and management, and processing the user and service data via the local server. Furthermore, there is only the SIP server in the core control, which is not in line with the IMS specification of dividing functions into Proxy–Call Session Control Function (P–CSCF), Inquiry–Call Session Control Function (I–CSCF) and Serving–Call Session Control Function (S–CSCF). However, the SIP server of product provision platform possibly becomes IMS ready and the commercial network organized by present SIP servers is difficult to evolve into NGN IMS.

3 IP Multimedia Subsystem and Its Orientation

The IMS was originally proposed by the Third Generation Partnership Project (3GPP) in the specifications of Release 5 (R5). The core structure, network element functions, interfaces, and procedures are defined in R5. The IMS service characteristics, interoperability specifications between IMS and other networks, and access of Wireless Local Area Network (WLAN) are added in R6. The standardization of FMC is strengthened in R7 to impose on IMS the support of fixed accesses via Digital Subscriber Line (xDSL), wireline modem and more. Presently the R5 and R6 are on hold.

The TISPAN and ITU–T SG13 are studying the NGN–related specifications with the starting point of fixed networks. The IMS is one of service components in NGN architecture defined by TISPAN. The TISPAN IMS expands function entities and protocols based on the 3GPP R6 IMS core specifications. It can support fixed access.

After the 3G licenses have been granted, each operator has the possibility to be a full–service operator. A traditional fixed network operator soon will probably build an IMS network under the market competition, even if he has established a R4 3G network with services. At the beginning, this IMS network can only accommodate 3G users, but its network protocols should consider the access of wireline broadband data users. In nature, it is better to plan the two user access requirements as a whole, and construct a convergence network at the very beginning. However, there are differences in service time and service type between wireline and wireless user accesses, which possibly makes the service networks apart. It is predictable that the unanimity of users' service requirements and the full–service operation of the operators will drive the convergence of the two networks. At that time, users can access the converged network through different access technologies or access networks, such as WLAN, Worldwide Interoperability for Microwave Access (WiMAX) and more.

The IMS is a multimedia/call control platform in Packet Switching (PS) domain. It grants PS some Circuit Switching (CS) functions and supports conversation or non–conversion multimedia services. The IMS is also a generalized service platform for future multimedia applications, such as presence, message, conference, Push–to–talk over Cellular (PoC), and other typical services. As to traditional mobile network operators, requirements for IMS are actually stimulated by the need of future FMC and current market. Consequently, not only the requirements of mobile users, but also the requirements of VIPs and potential fixed broadband users are worth to consider at the IMS network planning. However, it should be noted that the fixed services mainly imply broadband multimedia services, instead of PSTN/ISDN services. Therefore, only the PSTN Simulation Service (PSS) rather than the PSTN Emulation Service (PES) need to be supported when planning the IMS network.

In the future, the IMS users of broadband access have demands on multimedia services, and even streaming services. So far, multimedia services can be carried in NGN R1 and it has gotten ready to support streaming media services over IMS in NGN R2. The trigger mechanism of customized services that stored in the home service server is one of IMS advantages, which contributes to individual streaming media services (or IPTV service) to be implemented over IMS.

4 Conclusions

The NGN is an evolving network. Though the present research of NGN is focused on providing multiple services over a unified packet network, the likely change in each layer (the service layer, the bearer layer, and the transport layer) or each part (terminals, the client network, the access network and the core network) of NGN needs to be involved in the research area[1–6]. The Softswitch is a current NGN service resolution with little standardization, which has already been applied. On the contrary, IMS has a network framework standard, but having few applications. Considering the device implementation, Softswitch can smoothly evolve into IMS. However, there are difficulties for the network evolution, because Softswitch mainly supports traditional PSTN/ISDN services, while having the basic services and supplementary services supported locally.

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Biography

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